OUTLINES

for 4–H Club Grain Grading Demonstrations

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Illustration on front cover—Analysis of rye.

This publication supersedes Miscellaneous Extension Publication No. 62, "4-H Grain Grading Demonstrations" and was prepared especially for extension specialists and county extension agents working with 4-H Club members.

OUTLINES

for 4–H Club Grain Grading Demonstrations

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INTRODUCTION

It is suggested that the grain-grading demonstrations be kept as simple as possible and that you do not attempt to make complete grade demonstrations for every factor in the standards. This follows closely the commercial practice of inspectors who consider all factors, but limit their analysis to only the grade-determining factor. Your local grain elevator can assist in determining important grade factors. There may be a grain inspection laboratory nearby that the team members can visit to get illustrative samples. The local dealer may also have samples of grain and copies of inspection certificates from terminal markets covering grain which he has shipped.

Tie the demonstrations to local problems in order to get the maximum interest. Some of the demonstrations in this publication outline in detail the part the team members take because the subject is relatively new to 4–H Club Members. Other demonstrations in the bulletin are outlined briefly, as suggestions only, with the idea that the club members will fill in the details.

In most cases it will be necessary to revise or rewrite the demonstration to apply to your local conditions, as in demonstration 4c.

A good general procedure is to start with the end product, such as loaves of bread or samples of cornmeal of different qualities. Then working back through the marketing system, try to find the cause and discover the remedy for the apparent differences in the quality of the finished product.

4–H Club members learn by doing, and by watching and listening to others. The demonstrators will receive valuable experience in organizing important marketing information. Team demonstrations help to develop poise, originality, accuracy, and the ability to think and act in the presence of others. The time required to put on these demonstrations is relatively short (3 to 5 minutes). Considerable time, however, will be required for the study and preparation by team members who are unfamiliar with the subject matter.

The two publications listed below should be obtained, as page references used in these demonstrations refer to the subject matter in them:

Handbook of Official Grain Standards of the United States, July 1953. For sale by Superintendent of Documents, Government Printing Office, Washington 25, D. C., price 25 cents.

Grain Grading Primer, Agricultural Handbook No. 59,[1] U. S. Department of Agriculture, issued July 1953. For sale by Superintendent of Documents, Government Printing Office, Washington 25, D. C., price 20 cents.

Two filmstrips in color, with lecture notes, are also available:

C-9 Grain inspection methods (28 frames: Double).

C-10 Kernel damages and other conditions (33 frames: Double).

These filmstrips are available for purchase. Information as to price and contractor can be obtained from your State extension service or the Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

DEMONSTRATIONS

No. 1—Grain Sampling and Dockage Demonstration

Topic: How to obtain a representative sample of grain and test it for percentage of dockage.

Equipment: Grain trier or probe.
Sample bag.
Sampling canvas.
Set of dockage sieves.
Scale for weighing 1,000 grams.
Boerner divider.
Sample of wheat containing representative local dockage, such as fine weed seeds, corn, and oats. Also may contain rye.
Tall 2-bushel sack of grain.

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[1] Formerly Miscellaneous Publication No. 325

FIGURE 1.—Sampling with probe.

"A"	"B"
Makes introductory remarks on use of grades in commerce. Describes probe and cloth, and method of sampling at market point. (Fig. 1.) If possible, shows samples of grain in paper sacks obtained from a terminal cash market. (Agr. Handbook No. 59, pp. 5–7, 52.)	Arranges sampling cloth on long table. Draws 5-probe sample from 2-bushel sack representing grain bin.
"B"	"A"
Describes (1) tests for odors including musty and smutty, (2) weevil. (Agr. Handbook No. 59, pp. 38, 45, 49.)	Examines grain for odor and weevil.

"A"	"B"
Describes how sample is placed in bag and taken from car to inspection office. (Agr. Handbook No. 59, pp. 6–7.)	Places sample in sample bag.

"B"	"A"
Describes how sample is divided. (Fig. 2.) Shows photo of Boerner divider if apparatus is not available. Describes what "A" is doing. (Agr. Handbook No. 59, pp. 8–9, 52.) (Official Grain Standards, pp. 92–93.)	Divides sample on Boerner divider or cone and quarters. (Pile grain from bag sample in a cone on table and mix thoroughly. Take one-half of the pile by dividing with straightedge or cardboard.) Places one portion on scale and weighs.

FIGURE 2.—Divider and weight per bushel.

FIGURE 3.—Dockage with hand sieves.

"A"	"B"
Describes sieves and dockage method. (Agr. Handbook No. 59, pp. 20–30.)	Records weight of sample in grams on blackboard. Makes dockage determination with sieves. (Fig. 3.) Weighs dockage removed and computes percentage of dockage.
"B"	"A"
Describes dockage as first in series of steps in grading grain. Dockage is subtracted from weight of grain when sold. However, freight is paid on dockage if shipped to market. Points out economic loss to farmer: 1. Deductions in price. 2. Labor in cleaning. 3. Production loss in wheat yields.	Displays dockage separation. (*Note:* In many of these demonstrations the analysis is made before the audience. It is recommended that a separate analysis be made in advance and reviewed by a competent grader and this previously analyzed portion be passed around for examination in place of the one made by the demonstrators.

"B"	"A"
4. Grain goes out of condition more quickly when it contains dockage such as damp weed seeds. 5. Loss in test weight if sample is not cleaned before weighing.	This will save time and insure that correct determinations are exhibited.)
"A"	
"This completes our demonstration. Are there any questions?"	

No. 2—Weight-Per-Bushel Demonstration

Topic: The correct method for making a weight-per-bushel determination.

Equipment: Weight-per-bushel apparatus.
Samples of heavy and light test weight grain (dockage free).

"A"	"B"
Discusses importance of test as a measure of value and its place in grading, using blackboard. i. e. No. 1—60 lb., No. 2—58 lb., and so forth. Displays samples of grain. (Agr. Handbook No. 59, p. 25, grade table.)	Arranges apparatus for test.
"B"	"A"
Describes how test is made by official method. (Official Grain Standards, pp. 97–99.)	Makes determination by official method. Uses both heavy and light grain. (See front cover illustration.)

"A"	"B"
Announces result by official method. Discusses other methods used.	Varies method of filling kettle by changing height of funnel, and pouring from bag in small stream. Can have one-half bushel in shallow box representing wagonload and dip kettle into this for test. Then strikes off kettle with wooden stroker and follows with metal beam.
"B"	"A"
Announces result by nonstandard method. Discusses effect of moisture (dew, showers, and other sources of moisture) on test weight.	Makes weight determination in official manner.
"A"	
Announces result as compared to previous test by same method. "This completes our demonstration. Are there any questions?"	

No. 3—Demonstration of Rye Admixtures in Wheat

Topic: The extent of losses due to rye admixtures in wheat.
Equipment: One set even balances (50 gram capacity).
One set weights.
One pair tweezers.
Sample of dockage-free wheat containing rye.

"A"	"B"
Points out economic importance of growing wheat free from rye in State and in county: Market losses. Reasons for losses. (Agr. Handbook No. 59, pp. 36–37.)	Passes out samples of wheat containing: 3 percent rye. 6 percent rye. 12 percent rye.

"B"	"A"
Using blackboard, explains how total foreign material (not dockage) affects the numerical grade (mixed grain if over 10 percent rye). (Official Grain Standards, grade chart, p. 7.)	Passes out samples containing chess, wild sunflower seed, or cockle.
"A"	"B"
Explains "matter except other grains." Discusses weed seeds. Adds "matter except other grains" column to material already on blackboard. (Official Grain Standards, pp. 7, 18.)	Gets scales and samples ready. Weighs out 25-gram portion.
"B"	"A"
Tells how inspectors make rye analysis. Describes samples passed to audience. (Agr. Handbook No. 59, p. 37.)	Picks rye out of sample and weighs it. (See front cover.)
"A"	"B"
Announces weight of rye. Tells how samples grade on rye.	Writes on blackboard, computing percentage of rye.
"B"	"A"
Summarizes local application, price per bushel on market. (Remedies: Summer-fallowing, rotation, and pure seed.)	Puts summary on blackboard.
"A"	
"This completes our demonstration. Are there any questions?"	

No. 4—Moisture in Stored Grain

The proper storage of grain, in order to conserve food and feed resources, is of prime importance. While moisture is a major necessity for growing a grain crop, dryness is the important requisite for storing the crop. Keeping the moisture content of stored grain low will reduce many storage losses.

The upper limits of moisture for the safe keeping or storage of the different kinds of grain (recommended for Minnesota) are: For hard red spring and durum wheat and corn 14.5 percent; hard red winter, 14 percent; oats and barley, 13.5 percent; soybeans, 13 percent; and flaxseed, 10.5 percent. In warmer climates these limits should be lower. We must also remember that the moisture content may shift in bulk-stored grain. Changes in outside temperatures are responsible for changes in moisture.[2]

The demonstrations which follow have been used by 4-H Club members to show the importance of knowing the moisture content of the grain which is harvested. Most country elevators are now equipped with official moisture testers, and the cooperation of the owners of this equipment in testing samples should be sought.

No. 4a—Salt Test (Ammonium Chloride)

Topic: Moisture in wheat and oats.
Purpose: To determine if grain is dry enough to combine.
Equipment: Sample of dry and wet grain.
A few ounces of chemically pure ammonium chloride.
Two clean, dry pint fruit jars with airtight covers.

This demonstration has been used by 4-H Club members and is commonly known as the salt test. However, common table salt is not suitable, and only chemically pure ammonium chloride should be used. This chemical is available at any drug store at nominal cost. The salt test method was developed by Professor S. T. Dexter of Michigan State College.

To tell if grain is ready to combine, a handful of grain is shelled out of the head, or a sample of threshed grain may be used. The grain is put in a small dry bottle, fruit jar, or other airtight container, and a spoonful of ammonium chloride is added.

If, after shaking the bottle of grain and salt about fifty times, the salt does not become damp, lump, or cling to the side of the bottle, it indicates that the grain is dry enough to store or combine. If the salt sticks to the side of the bottle, the grain is likely to mold within a few days in warm weather.

To run a test requires from a few seconds up to perhaps one minute. The team might divide the demonstration as follows:

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[2] Minnesota Extension Folder No. 173, "It Pays To Protect Stored Grain."

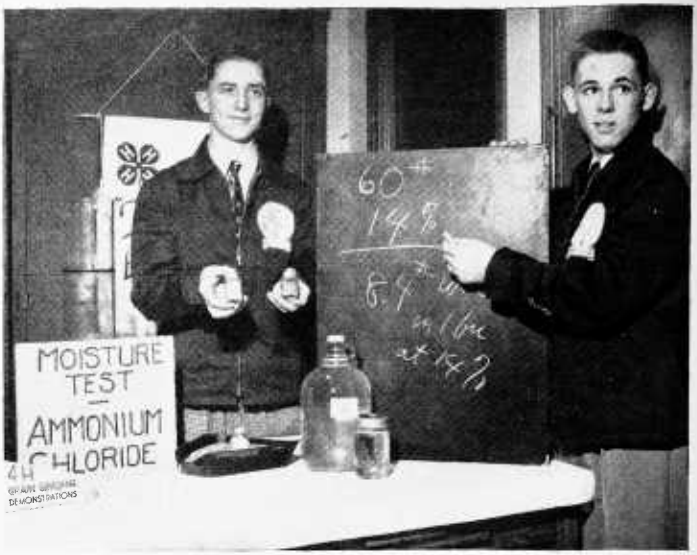


FIGURE 4.—Salt Test.

"A"	"B"
Discusses the importance of moisture in stored grain. "We will demonstrate a 5-cent moisture test that any farm boy can run. "Go to the drug store and get 5-cents' worth of ammonium chloride in a well corked bottle; the bottle may cost another nickel. The druggist uses this ammonium chloride when he compounds that dark brown cough syrup. The salt has some medicinal value and, in addition, gives the syrup that wonderful taste. "Next, get a clean dry bottle that has an airtight lid. Put a teaspoon of the salt in the container and you are ready. Then add a handful of wheat, cork the bottle and shake it fifty times, as 'B' is doing."	Gets the exhibits in order; makes the moisture test on dry grain as "A" describes it.

"B"	"A"
Describes the appearance of the salt in the bottle. "Since this salt still runs freely it indicates that the wheat is below 14-percent moisture and should be ready for combining. However, we must remember that wheat does not dry in the combine. It will increase in moisture a little even with a clean crop. But if the crop is weedy, the wheat might pick up as much as 3 percent moisture from the green weeds. Therefore, it would seem logical to make this moisture test after the wheat had gone through the combine. You do not need to run the combine very far to get enough wheat to fill this bottle. "My partner is now making a test on another sample to see if it is dry enough to combine."	Makes the salt test on a sample of damp grain (over 14-percent moisture).
"A"	
Describes the appearance of the salt in the bottle after shaking with the damp grain. "You will note that the salt has taken up the moisture from the grain and is sticking to the side of the bottle. This indicates that the wheat is over 14-percent moisture and is a dangerous product to handle in storage. Sometimes, with real wet wheat, the salt will disappear in the bottle and all that you will see is salt water clinging to the side of the bottle. Then you are in trouble, because the moisture content is somewhere around 16 or 17 percent. However, it has been found that many farmers combine wheat at this point."	

"A"	
Discusses the danger of spoilage in storage, the susceptibility of wet grain to insect infestation and the official moisture test apparatus used by country elevators. (Fig. 5, p. 19.) "This completes our demonstration. Are there any questions?"	

No. 4b—Demonstration of Moisture in Stored Wheat

Topic: To show the relation of moisture to wheat grading and to farm storage.

Equipment: One 4,000 cubic centimeter cylindrical graduate or other glass container.
One gallon glass jug.
Two pint bottles.
(Fig. 4, p. 10.)

The following chemicals are also needed, but should not be in evidence during the demonstration:

Phenolphthalein U. S. P.—1 percent in 95 percent alcohol.
50 cubic centimeters 30-percent solution sodium hydroxide (NaOH) in 150 cubic centimeters of water.
Hydrochloric acid .6N (indicates .6 normal strength).
Starch solution—1 gram soluble starch plus 10 milligrams mercury iodide red (preservative).
Mix to paste with cold water; add 500 cubic centimeters boiling water; boil until clear.
1 ounce potassium iodide crystals.
1 ounce potassium iodate crystals.

In advance of the demonstration, prepare the glass containers as follows:

Using a medicine dropper, add six dropperfuls of phenolphthalein solution to the gallon jug of water.

To the first bottle containing a little water add four crystals of potassium iodide and two dropperfuls of NaOH solution.

To the second bottle containing a little water add potassium iodate in double the quantity of potassium iodide placed in the other bottle. Add four dropperfuls of the acid solution and 30 cubic centimeters of the starch solution.

All of these solutions will then appear colorless, but when mixed together the color changes appear. Use separate droppers for each solution.

"A"	"B"
Points out: Importance of water to growing crop. Importance of dryness to harvested grain. Tough wheat grades, 14- to 15.5-percent moisture in winter wheat. Amount of water in bushel of grain containing 14-percent moisture. Pounds converted to liquid measure a little over 1 gallon. (Agr. Handbook No. 59, pp. 27–29, 47, table 4.)	Figures on blackboard: .14 60 lb. 8.40 lb. (Fig. 4.) Gets glassware ready.
"B"	"A"
Pours 1 gallon of water containing phenolphthalein into 4,000 cubic centimeter container to indicate amount in 1 bushel of wheat at 14-percent moisture.	Pours water from pitcher into first bottle, which already contains chemicals in solution.
"A"	"B"
Pours contents of first bottle into 4,000 cubic centimeter container. Discusses tough grade. (Red a danger signal.) (Agr. Handbook No. 59, p. 33.)	Pours water from pitcher into second bottle, which already contains chemicals in solution.
"B"	
Pours contents of second bottle into 4,000 cubic centimeter container and discusses sample grade.	
"A"	"B"
Summarizes results and gives remedies: Combining when dry. Effect of showers on test weight per bushel.	Gets pictures of a moisture tester ready.

"B"	"A"
Describes how inspectors test for moisture. (Fig. 5, p. 19.) (Agr. Handbook No. 59, pp. 27–28.)	Cleans up glassware and removes same.
"A"	
"This completes our demonstration. Are there any questions?"	

No. 4c—Moisture in Stored Wheat

The following demonstration writeup, based on the preceding material, was prepared by a 4–H Club team.

Equipment:

Samples of dry, tough, and heated wheat.
Solutions of phenolphthalein.
One pint of water containing solution of 4 crystals of potassium iodide and 2 droppers of sodium hydroxide solution.
One-half pint of water containing solution of 8 crystals of potassium iodate, 4 droppers of hydrochloric acid solution .6N (indicates .6 normal strength), and 30-cubic centimeters starch solution.
One 4,000-cubic centimeter graduate.
One gallon glass jug.

CAPTAIN—"Mr. Chairman: We are the crops demonstration team of _____ 4–H Club. This is my teammate _____, and I am _____, the Captain. We are going to give a demonstration on moisture in stored grain in an attempt to show the importance of the amount of moisture in the grain when it is stored and the importance of controlling this moisture at a normal or natural amount. Moisture in natural or normal amounts is found in practically everything with which we come in contact, but additional, or even smaller, quantities have a definite effect on these materials. Under some conditions, as silage for example, we want added moisture, first for succulence, and second to produce a heat of sufficient degree to obtain sterility and, hence, preservation. Hay stored under even a smaller percentage of this moisture condition would heat, cake, and spoil, not to mention the danger of combustion in the loft.

"My teammate will show you the difference between forcing a pin through a dry cloth and the same cloth when wet. Notice the difference between the ease of shearing dry straw and the same kind of

straw when wet—how much tougher the moist substances are. Now, we not only find the same difference in wheat, but have the added factor of heat causing spoilage. Grain with a normal amount of moisture behaves when being processed, but toughens when carrying additional moisture, and furthermore, heats and spoils."

TEAMMATE—"It would be well for us to get down to actual figures and the lines of demarcation between them. Our 'dry' wheat in reality contains, under normal conditions, 14 percent moisture. This moisture then, on the basis of 60 pounds to the bushel, would be actually 8.4 pounds, or a whole gallon of water per bushel—water that is harmless. Here is our gallon of water—clear, pure, and wholesome.

"Now let us see what happens when we increase this moisture even slightly. To make our wheat tough, we need only an additional 1.5 percent. Let us see—that would be only .9 of a pound, a little less than a pint. Here is this water as clear, just as wholesome, just as harmless in itself but, which when added to the 8.4 pounds we already have, produces this tough grain that is as difficult to mill as the straw was to cut. If milled, it will produce a poor quality of flour. To be milled properly it must be aerated and dried to reduce the moisture content down to the desired 14 percent. This is called the danger zone. Notice its effect on the original quantity of water we have—the 14 percent of one gallon.

"Now, should this quantity go up to 16 percent, which it could easily do, we would have an additional 1.2 pounds of water over the dry wheat and 0.3 pound over 'dangerous' or tough wheat. This condition would mean a total loss were this grain stored. Heating would result and, since we can cook wheat only once, it would be ruined. Notice the effect when this quantity of water is added to the already dangerous content of 15.5 percent—a total loss."

CAPTAIN—"Now, for two outstanding facts relating to moist grain:

1. It is lighter in test than the same quality when dry.
2. Weevil and storage insects attack tough and dangerous grain much more readily.

"This further increases the grower's loss on such grain. Little could be accomplished, however, without some recommendations toward remedying the evil of too much moisture. They are, as you see on the chart:

1. Cut wheat only when ripe.
2. Do not plant mixed wheat which ripens unevenly.
3. Do not cut when wheat is wet from dew or rain.
4. Store only thoroughly dry grain.

"Are there any questions? If not, let us say we have tried to point out the dangers of improper storage conditions of wheat in connection with moisture. We thank you."

No. 4d—Demonstration of Moisture in Stored Corn

Topic: The relation of moisture to corn grading and to farm storage.

Equipment: One 1-gallon glass jug.
One 2,000 cubic centimeter graduate (or ½-gallon glass jug).
Five 1-quart glass jars numbered 2, 3, 4, 5, and S.
One large glass pitcher.
One 8-quart pail of water and dipper.
Three medicine droppers.

The following chemicals are also needed, but should not be in evidence during the demonstration:

Phenolphthalein U. S. P.—1 percent in 95 percent alcohol.
Fifty cubic centimeters of 30-percent solution sodium hydroxide (NaOH) in 150 cubic centimeters of water.
Hydrochloric acid .6N (indicates .6 normal strength).
Starch solution—1 gram soluble starch plus 10 milligrams mercury iodide red (preservative); mix to paste with cold water; add 500 cubic centimeters boiling water, boil until clear.
1 ounce potassium iodide crystals.
1 ounce potassium iodate crystals.

In advance of the demonstration, prepare the glass containers as follows:

Using a medicine dropper, place six dropperfuls of phenolphthalein solution in the gallon glass jug.

Place nothing in the 2,000-cubic centimeter graduate. It is to be used as a receptacle in the demonstration.

Mark the quart glass jars on the outside so that they may be filled again with the following amounts from a pitcher:

Jar No. 2—0.8 pint or 381 cubic centimeters.
Jar No. 3—1.1 pints or 508 cubic centimeters.
Jar No. 4—1.3 pints or 635 cubic centimeters.
Jar No. 5—1.6 pints or 762 cubic centimeters.
Jar No. S—½ pint.
Gallon glass jug—7.4 pints or 3,560 cubic centimeters.

Empty the quart jars and dry.

Place one dropperful of phenolphthalein in jar No. 2.

Place one dropperful of NaOH solution in jar No. 3.

Place about four small crystals (what can be carried on point of penknife blade) of potassium iodide in jar No. 4.

Place potassium iodate in jar No. 5 in double the quantity of potassium iodide placed in jar No. 4. Add a little water and three dropperfuls of the acid solution. (Warning—do not spill acid on clothing.)

Place 25 cubic centimeters of the starch solution in jar No. 5, and add one dropperful of NaOH solution.

Note: The foregoing preparations should be made in advance and out of sight of the audience. If the water is alkaline when tested with phenolphthalein, it must be neutralized with one or two drops of acid solution.)

"A"	"B"
Explains the importance of dryness to stored corn and the limits for moisture in shelled and ear corn to be eligible for a farm storage loan. Ear corn: *Moisture percentage* Dec. 1-Mar. 31 ..... 20.5 Apr. 1-Apr. 30 ..... 17.5 May 1-Sept. 30 ..... 15.5 Shelled corn: After July 1 ..... 13.5 (Agr. Handbook No. 59, p. 27.)	Place limits for moisture in corn grades on blackboard: *Grade* — *Moisture percentage* No. 1 ..... 14.0 No. 2 ..... 15.5 No. 3 ..... 17.5 No. 4 ..... 20.0 No. 5 ..... 23.0 Sample grade over 23.0 (fig. 5).
"B"	"A"
Explains limits for moisture in commercial grades and use of moisture testers, using photograph of commercial testers or demonstrating electric tester if one is available. (Agr. Handbook No. 59, pp. 27–28.) (Official Grain Standards, p. 21.)	Arranges glassware for demonstration, lining up gallon jug, quart glass jars, water pail, and pitcher which have been prepared beforehand as directed above. Fills pitcher with water.
"A"	"B"
Discusses amount of water allowed in one bushel No. 1 corn; i. e., 14 percent. Pours water from pitcher into gallon jug until filled to mark at 7.4 pints. (*Note:* This is ½ percent more moisture than loan requirements for shelled corn stored on farm.)	On blackboard computes pounds of water in one bushel of corn. 56 lb. .14 224 56 7.84 lb. or 7.4 pt. 1 pint=1.0419 pound.
"B"	"A"
Discusses amount of additional water allowed in No. 2 corn; i. e., 1.5 percent more or 15.5 percent total allowance.	Fills pitcher with water. Pours into jar No. 2 to 0.8 pint mark.

"B"	"A"
Pours solution from jar No. 2 into second gallon jug or into 2,000-cubic centimeter graduate if available. This should fill graduate to 381-cubic centimeter mark.	
Discusses water allowed in No. 3; i. e., 17.5 percent—2 percent or 1.1 pints more than in grade No. 2. Pours solution from jar No. 3 into second jug or 2,000-cubic centimeter graduate with solution already prepared from jar No. 2. This should fill graduate to the 889-cubic centimeter mark, and the solution should change to bright red color.	Pours water from pitcher into jar No. 3 to 1.1 pints mark.
Discusses water allowed in No. 4 grade; i. e., 20 percent—2.5 percent or 1.3 pints more than in No. 3.	Pours water from pitcher into jar No. 4 to 1.3 pints mark.
Pours solution from jar No. 4 into second gallon jug or 2,000-cubic centimeter graduate, if used. This should fill the graduate to 1,524-cubic centimeter mark. (No color change occurs.)	Pours water from pitcher into jar No. 5 to 1.6 pints mark.
Discusses water allowed in No. 5 grade; i.e., 23 percent—3 percent or 1.6 pints more than in No. 4.	Pours about ½ pint water into jar S.
Pours solution from jar No. 5 into second glass jug or 2,000 cubic centimeter graduate, if used. It may not hold all of the solution, but do not fill graduate to the rim. (Color changes to yellow.)	
Over 23 percent is sample grade corn.	Hands jar S to "B."
Adds part of solution from jar S to second glass jug or 2,000-cubic centimeter graduate. (Color changes to deep black.)	
Adds remainder of solution from jar S to first glass jug containing 7.4 pints placed there to show water in No. 1 corn. (Bright red color appears.)	

FIGURE 5.—Moisture tester.

"A"	"B"
Discusses effect of moisture content on keeping quality and dry matter values. Gives available local and state data on how current corn crop is grading on moisture. (Agr. Handbook No. 59, pp. 27–28.) "This completes our demonstration. Are there any questions?"	Removes and packs glassware and pours solutions into pail.

No. 5—Damaged Wheat Demonstration

Topic: To show the effect of damaged wheat in merchandising wheat and in bread baking.

Equipment: One set of balances, 50-gram capacity.
One pair tweezers.
A sample of badly damaged wheat, sample of flour made from this wheat, and a loaf of bread baked from the flour.
A sample of sound wheat.
A sample of sound flour, and a sample of bread made from this flour.
(Optional) Film strip C–10 USDA "Damaged Kernels and Other Conditions".)

One loaf of bread is to be baked at home using flour the family ordinarily uses. A second loaf is to be baked using the same formula but substituting the damaged flour. Special arrangements must be made with some milling laboratory to grind the damaged sample and produce the low quality flour.

"A"	"B"
Discusses the two loaves of bread which "B" displays, mentioning the flour quality, baking recipe, odors, taste, etc. (Agr. Handbook No. 59, p. 32.)	Holds up the loaves of bread, and passes them around for examination (fig. 6).
"B"	"A"
Discusses the sample of low quality wheat from which the flour was made, and also the sample of sound wheat; announces the grade factors and writes down the grade limitations for damage on the blackboard. Tells what "A" is doing. (Handbook of Official Grain Standards, p. 7.) (Agr. Handbook No. 59, p. 34.)	Makes a damage analysis for the low grade sample and determines the percentage of damage by weight. (*Note:* In this demonstration the analysis is made before the audience. It is recommended that a separate analysis be made in advance and reviewed by a competent grader and this previously analyzed portion be passed around for examination in place of the one picked by the demonstrators. This will save time and insure that correct determinations are exhibited.)

FIGURE 6.—Bread of various qualities.

"A"	"B"
Discusses type of damage and heat damage using film strips or leaflet No. 19, Kansas State College, entitled "Principal Wheat Kernel Damage." (Agr. Handbook No. 59, pp. 29–32.)	Runs projector for "A" or displays charts or kernel models illustrating damage.
"B"	"A"
Discusses the causes of damage, both field and storage. Discusses remedies: cutting when dry, frequent examination and fumigation.	Passes samples of wheat around for examination.
"A"	
"This completes our demonstration. Are there any questions?"	

No. 6—Insect Control Demonstration

Topic: Weevil in stored grain.
Extent of losses in wheat due to insects.

Equipment: Set of slides on insect damage—projector and screen.
A large wheat kernel model (18 inch)with a hollow center and a handhole entrance. The model can be made of asbestos plaster, using an oatmeal box for a foundation and strengthened with a wire mesh frame. After drying, the plaster can be painted and finished to resemble a wheat kernel; or "Rural Residence of Mr. Weevil" poster can be drawn on blackboard. (Fig. 7.)

"A"	"B"
Describes losses due to insects in the county and State. Describes the life cycle of the weevil, pointing out that the insect spends part of its life cycle (30 days) within the kernel as a worm. Food is no problem there. The problem is sanitation. The emergence hole (handhole) indicates that the insect has gone; however, he was a poor housekeeper while within the kernel. Tells what "B" is doing.	Gets the wheat kernel model ready and displays it when "A" talks about the life cycle of the insect. At the close of "A's" talk removes from within the kernel several articles to simulate insect filth. (fig. 7.) 1. Stove and pump represent basic needs of heat and moisture. 2. Skin casts (underwear). 3. Excreta (string of black beads and bottle of colored water) or draws "Rural Residence of Mr. Weevil" poster on blackboard.
"B"	"A"
Describes control measures, bin cleaning and bin spraying before the grain is placed in the bin. Shows a second spraying with an approved insecticide two weeks after the grain is placed in the bin.	Gets control apparatus ready for display. 1. Shovel for leveling the grain. 2. A 3-gallon garden spray. 3. An insecticide containing DDT for bin spraying. 4. An approved insecticide to be used on the stored grain.
"A"	"B"
Tells about the relationship of moisture content and temperature to weevil infestation.	Gets the projection machine and slides or posters ready to display.

FIGURE 7.—Model wheat kernel showing insect.

"B"	"A"
Describes the slides or posters on insect contamination and control.	Runs the projector or displays the posters as "B" talks.
"B"	
"This completes our demonstration. Are there any questions?"	

No. 7—Soybean Grading Demonstration

Topic: How quality in soybeans is measured by grain standards.

Equipment: Samples of soybean meal and soybean oil.
Sample of soybeans with heavy mixture of weed seeds.
Grain trier.
Divider.
Moisture tester.
Grain scale.
Sieves.
Grain pans.
Charts of soybean grades.

References: The Story of Soybeans, Chicago Board of Trade.
Eight Steps in Grading Soybeans, USDA, AIS–84. June 1949.

"A"	"B"
Points out that: Last year the farmers of _____ _____ county produced _____ bushels of soybeans. When these soybeans are processed 80 percent of the product is soybean meal and less than 20 percent is soybean oil. Discusses uses of oil and meal and the industrial products made from both.	Gets samples of meal and oil ready and hands them to "A". Other industrial products may be shown, such as upholstery cloth, soybean glue, and others.
"B"	"A"
Points out that: Before all of these products can be made, the soybeans must be planted, grown, harvested, and sold through commercial channels. The sale at terminal markets and at many country points is made on a grade analysis. "It is our purpose to show you if your soybeans will grade high or low. "The first step, and perhaps the most important, is to start with a fair sample of the beans. This trier is recommended equipment for sampling soybeans. (Holds up the grain trier.) "Let us assume that we have a good sample here in this bag.	Gets moisture machine ready to run.

"B"	"A"
"The next step is to smell the sample to see if the grain is sweet and not musty, sour, or heating; these conditions would cause the beans to be classified as sample grade, the lowest one. This is a good time to examine the grain to see if it is infested with moths or other insects that injure the grain. "Using this divider or splitter, I will cut out a small portion of the grain for a moisture test, place it in this air-tight can closed with a rubber stopper, through which a thermometer has been inserted, and give it to my partner for moisture testing." [3]	
"A"	"B"
Runs moisture test and explains what he is doing, announces the results and grade on moisture.	Displays chart of soybean grades and gets weight-per-bushel tester ready.
"B"	"A"
Makes the weight-per-bushel test and explains how it is made; anounces the result and the grade of the soybeans on the test weight factor. (Agr. Handbook No. 59, p. 25.) Describes what "A" has been doing in removing the foreign material, and gives some of the cultural and harvesting practices recommended for weed control in soybeans. Using the blackboard, figures the percent of foreign material from the weights "A" has found and determines grade of the sample on the basis of foreign material.	Cuts sample through divider to work sample (125 grams). Weighs and screens over ⅛-inch round hole sieve. Picks out the coarse foreign material remaining on the sieve and weighs the material removed. Clears the table of samples and apparatus and packs equipment.

[3] Agricultural Information Series No. 84, "8 Steps in Grading Soybeans."

"A" "There are other grade factors, such as splits, damaged beans and mixtures of other colors, that are important in some areas, but we have demonstrated here the most common factors which grade soybeans in this country. "This sample would grade No. _____ account of _____ and on today's market would be worth approximately ____ cents per bushel on the local market."	
"B" "This completes our demonstration. Are there any questions?"	

No. 8—Rice Grading Demonstration

Official U. S. Standards for rough rice, brown rice, and milled rice, effective July 1, 1951, were published in the Federal Register on May 3, 1951.

Rough or paddy rice is rice in which 50 percent or more of the kernels have the hulls on them. Brown rice is rice in which 50 percent or more of the kernels have the hulls off. Milled rice is the milled product for which four classifications are provided; they are Milled Rice, Second Head Milled Rice, Screenings Milled Rice, and Brewers Milled Rice. These classifications are based on the percentage of whole kernels and the percentage of broken kernels of various sizes. The rice producer is interested primarily in the standards for rough rice.

FIGURE 8.—Rice grading equipment.

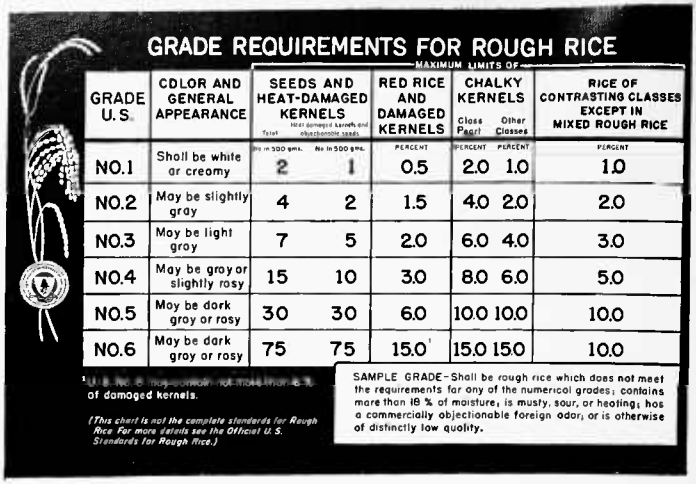
Grading Rough Rice

The rough rice grades classify the grain by variety types, such as Rexoro, Blue Bonnet, Zenith, and others. Each class is divided into six numerical grades, U. S. sample grade, and special grades for damp and weevily rice.

The rough rice is examined for odors, temperature, weevil infestation, and is tested for moisture content, weight per bushel, and removable foreign materials (dockage).

The sample is then hulled and milled by special laboratory equipment. (Fig. 8.) The whole kernels of milled rice are designated "Head Rice." This head rice is examined for contrasting classes, color and general appearance, chalky kernels, red rice, damaged kernels and seeds. If the moisture content does not exceed 18 percent, a test for milling yield is made and becomes part of the grade designation. Milling yield is an estimate of the quantity of head rice and of the total milled rice that can be produced from a unit of rough rice.

The following grade chart is used in the grading of rough rice.



GRADE REQUIREMENTS FOR ROUGH RICE

GRADE U.S.	COLOR AND GENERAL APPEARANCE	SEEDS AND HEAT-DAMAGED KERNELS (Total / Heat damaged kernels and objectionable seeds)		RED RICE AND DAMAGED KERNELS	CHALKY KERNELS (Class Pearl / Other Classes)		RICE OF CONTRASTING CLASSES EXCEPT IN MIXED ROUGH RICE
		MAXIMUM LIMITS OF					
		No. in 500 gms.	No. in 500 gms.	PERCENT	PERCENT	PERCENT	PERCENT
NO.1	Shall be white or creamy	2	1	0.5	2.0	1.0	1.0
NO.2	May be slightly gray	4	2	1.5	4.0	2.0	2.0
NO.3	May be light gray	7	5	2.0	6.0	4.0	3.0
NO.4	May be gray or slightly rosy	15	10	3.0	8.0	6.0	5.0
NO.5	May be dark gray or rosy	30	30	6.0	10.0	10.0	10.0
NO.6	May be dark gray or rosy	75	75	15.0	15.0	15.0	10.0

[1] U.S. No. 6 may contain not more than 4 % of damaged kernels.

(This chart is not the complete standards for Rough Rice. For more details see the Official U.S. Standards for Rough Rice.)

SAMPLE GRADE—Shall be rough rice which does not meet the requirements for any of the numerical grades; contains more than 18 % of moisture, is musty, sour, or heating; has a commercially objectionable foreign odor; or is otherwise of distinctly low quality.

FIGURE 9.—Grade requirements for rough rice.

Because rice inspection equipment is not generally available for use in educational work, rice grading might well begin with a tour of one of the rice laboratories in the production area. During this visit illustrative materials and samples could be collected that might be used in the demonstration after the team returns home. This material might include samples of heat damage, objectionable seed, red rice, chalky kernels, rice of contrasting classes, a sample of rough rice, and a portion of the same sample after it has been milled.

Order of Examination

The following outline is given to show the various steps in rice grading.

Odor and temperature:

The rice is sample grade if heating, musty, sour, or has any commercially objectionable foreign odor, or is contaminated by rats, mice, or birds. If infested with live insects injurious to stored rice, the weevily grade is applied.

Moisture content:

From 14 to 18 percent rice is damp. Over 18 percent is sample grade.

Weight per bushel (optional):

Used to compute quantity of rice in bins, but is not a grading factor.

Removable foreign material (dockage):

All matter other than rough rice that can be removed readily from the rough rice by the use of appropriate sieves and cleaning devices; underdeveloped, shriveled, and small pieces of kernels of rough rice which are removed in properly separating the foreign

material and cannot be recovered by proper rescreening or recleaning. See Grain Grading Primer, Agricultural Handbook No. 59, pages 20 to 24. The dockage machine used in rice inspection makes use of three riddles and ten sieves in the grading of rough rice. It might be that approximate results could be obtained by using a set of wheat screens to demonstrate what is meant by removable foreign material.

Milling yield:

This is an estimate of the quantity of head rice and of the total milled rice that can be produced from a unit of rough rice. This test approximates the milling process, and the laboratory sheller and miller are needed to make this determination.

Examination of the Head Rice

If present, and likely to be a grade factor, tests are made of the head rice for the following:

1. Contrasting classes.
2. Color requirements. No. 1, white or creamy; No. 6, dark gray or rosy. See grade chart for other color requirements.
3. Chalky kernels. A chalky kernel is a kernel that is one-half or more chalky.
4. Red rice. Red rice has one full length streak of color on the milled kernel or two streaks of less than full length.
5. Damaged kernels. Damage includes the kernels which are materially discolored by heat, insect bored, so-called "pecky" kernels (fungus damage), and slightly heat damaged.
6. Seeds. Seeds include barnyard grass, water grass, and Japanese millet, which are not considered as objectionable seeds. All other seeds are designated as objectionable.
7. Distinctly low quality. This term is incorporated in the standards to provide for the grading of occasional lots of rice which are obviously of distinctly low quality, but for which no other provision has been made in the standards.

No. 9—Demonstration of Factors (other than moisture) [4] Affecting Quality and Grade of Corn

Topic: How several grading factors affect the quality of the corn raised in the county.

Equipment: Sample of shelled corn containing foreign material and damaged kernels.
Weight-per-bushel tester.
12/64-inch round-hole sieve.
Small scale or balance.
Boerner divider if available.

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[4] "7 Questions to Ask When You Buy or Sell Shelled Corn by Grades." USDA Extension Service Leaflet No. 318, February 1952

Important steps in grading a sample of corn:

1. Obtain sample and examine for odor.
2. Thoroughly mix the sample.
3. Weigh out about 1,000 grams.
4. Determine weight per bushel.
5. Sieve for foreign materials.
6. Cut out small portion (about 250 grams), weigh, and pick out damaged kernels.
7. Pick out other classes (colors).
8. Run moisture test.
9. Apply the correct grade.

A diagram such as the following may be placed on the blackboard or on a large sheet of wrapping paper for use during the demonstration. As the team proceeds, the different results may be placed in the outline and at the end of the demonstration the grade of the grain may be shown.

Corn

Grade No.	Minimum test weight per bushel	Maximum limits of—			
		Moisture	Cracked corn and foreign material	Damaged kernels	
				Total	Heat
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*
1					
2					
3					
4					
5					
Sample grade					

(For steps 1 and 2, use Demonstration No. 1 up to description of sieves and dockage method.)

"A"	"B"
Describes weight-per-bushel apparatus and also $\frac{7}{64}$-inch sieve for removing foreign material. (Agr. Handbook No. 59, pp. 25–35.) (Official Grain Standards, pp. 97–99.)	Weighs out about 1,000 grams of corn and makes weight-per-bushel test, and enters on chart on blackboard.
"B"	"A"
Describes test for foreign material in corn and makes test. (Agr. Handbook No. 59, p. 35.)	Figures percentage of foreign material and enters result on chart.

"A"	"B"
Describes test for damage in corn. (Agr. Handbook No. 59, p. 32.) Describes test for class. (Agr. Handbook No. 59, p. 17.) (Official Grain Standards, p. 20.)	Cuts out 250-gram portion and picks for damaged kernels and other colors. Weighs up separations. (*Note:* Use 100 grams if pressed for time, although 250 grams is recommended amount for commercial grading.)
"B"	"A"
Announces weight of separations. Selects arbitrary moisture percentage in lieu of making test. Announces final grade of sample. (Extent of lower grades in county. Factors affecting grades at local points.)	Computes percentage of damaged kernels and other colors on blackboard. Enters percentage of moisture selected on blackboard. Passes separations around in audience. (*Note:* In this demonstration the analysis is made before the audience. It is recommended that a separate analysis be made in advance and reviewed by a competent grader and this previously analyzed portion be passed around for examination in place of the one picked by the demonstrators. This will save time and insure that correct determinations are exhibited.)
"A"	
"This completes our demonstration. Are there any questions?"	

No. 10—Demonstration of Structure of Oat Standards

Topic: Common quality factors that determine oat grades in the county.

Equipment: Sample of oats containing barley and mustard seed.
Weight-per-bushel tester.
Small scale or balance.
Boerner divider if available.

Important steps in grading a sample of oats:

1. Obtain sample. Examine for odor.
2. Thoroughly mix the sample.
3. Test for moisture. (May be omitted in this demonstration.)
4. Make weight-per-bushel test.
5. Determine sound cultivated oats, foreign material, and other grains.
6. Determine general appearance.
7. Apply the correct grade.

A diagram such as the following may be placed on the blackboard or on a large sheet of wrapping paper for use during the demonstration. As the team proceeds the different results may be placed in the outline, and at the end of the demonstration the grade of the grain may be shown.

Oats

Grade number	Minimum limits of—		Maximum limits of—			
	Test weight per bushel	Sound cultivated oats	Heat-damaged kernels	Foreign material	Wild oats	Other grains
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1						
2						
3						
4						
Sample grade						

(For steps 1 and 2 see Demonstration No. 1 up to description of sieves.)

"A"	"B"
Discusses production and uses of oats in the county and market grading of cash oats sold.	Secures sample. Examines for odor and cuts to about 1⅛ quarts.

"B"	"A"
Discusses chart on blackboard and tells how he obtained sample. Discusses moisture testing.	Gets test weight apparatus ready.
"A"	"B"
Discusses and makes weight-per-bushel test. Cuts sample to about 30 grams.	Records weight in proper place on chart.
"B"	"A"
Discusses sound cultivated oats, foreign material and other grains, and figures percentage of each on blackboard, entering in proper place.	Picks sample for sound cultivated oats, foreign material, wild oats and other grains, and weighs.
"A"	"B"
Discusses general appearance. (Agr. Handbook No. 59, p. 37.) Discusses bright oats. (Agr. Handbook No. 59, p. 42.)	Passes around samples of bright and slightly weathered oats (No. 3) or badly stained oats (No. 4).
"B"	"A"
Announces appearance of sample being graded.	Writes complete grade designation of sample on blackboard.
"A"	
"This completes our demonstration. Are there any questions?"	

No. 11—Barley Inspection Demonstration

Topic: Some of the quality factors in the malting barley standards.

Equipment: Samples of barley containing oats, mustard seed, corn, and other material.
Weight-per-bushel apparatus.
Scalper sieve (a sieve that will let barley pass through but retain corn and soybeans.)
Small buckwheat sieve.
Barley pearler.
Small scale or balance.
Tweezers.

A diagram such as the following may be placed on the blackboard or on a large sheet of wrapping paper for use during the demonstration. As the team proceeds, the different results may be placed in the outline. At the end of the demonstration the grade of the grain may be shown.

Barley Requirements

Grade number	Minimum limits of—		Maximum limits of—			
	Test weight per bushel	Sound barley	Heat-damaged kernels (barley, other grains, wild oats)	Foreign material	Broken kernels	Black barley
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1						
2						
3	43	90	0. 5	3	12	2. 0
4						
5						
Sample grade						

"A"

Explains briefly requirements for malting barley subclass. (Agr. Handbook No. 59, pp. 18–20. Table p. 63.)

"B"

Lists on blackboard malting barley specifications:

	Percentage
Two-row, etc.	Not over 5
Undersized	Not over 15
Skinned and broken	Not over 5
Damaged	Not over 4
Mellow	At least 75

Grade—No. 3 or better.

"B"	"A"
Explains how dockage is determined in barley. (Agr. Handbook No. 59, p. 23.) Explains tough barley. (Agr. Handbook No. 59, p. 47.)	Makes dockage test with sieves. Figures percentage on blackboard. Runs moisture test, if tester is available, and announces results.
"A"	"B"
Explains in detail determination for malting barley that is important in county; i. e., two-row, thin, mellow, etc. Explains why pearler is used. (Agr. Handbook No. 59, pp. 18–20, 47, 58, 62.)	Makes determination while "A" describes it. Pearls a sample on the barley pearler. (Fig. 10.)

FIGURE 10.—Barley pearler.

"B"	"A"
Explains grade requirements using chart and places test-weight result in proper place on blackboard.	Makes weight-per-bushel determination and announces result. Cuts sample to 30 grams.
"A"	"B"
Tells what "B" is doing and figures percentage on blackboard and enters on chart in proper place. Announces complete grade.	Determines foreign material, and damaged and sound barley. Weighs and announces result.
"B"	"A"
Tells how barley in county is graded and what the important grading factors are. Points out possibility of farm practices to eliminate grade losses.	Writes complete grade on blackboard.
"A"	
"This completes our demonstration. Are there any questions?"	

ASSISTANCE TO 4–H CLUB LEADERS

4–H Club leaders and teachers will find a number of agencies willing and ready to assist with 4–H Club team demonstrations in grain grading. The local grain elevator may be the first place to ask for assistance. They may have equipment that can be borrowed for demonstration purposes.

The county extension agent can give information on training 4–H Club demonstration teams, and can offer suggestions for presenting grain-grading demonstrations before interested groups of farmers.

Publications on 4–H Club demonstrations may be obtained from the State 4–H Club leader at the State college of agriculture. The county agricultural Stabilization and Conservation offices of the U. S. Department of Agriculture are equipped with at least a part of the grain-grading apparatus. Assistance on technical details of grading any grain can be obtained from licensed grain inspectors or from any offices of the grain inspection supervisors listed inside the back cover of the U. S. Department of Agriculture Handbook No. 59, Grain Grading Primer. The extension services and the agronomy departments of the various State agricultural colleges carry on work in grain grading.

Planning a Demonstration

1. Write down the topic of the demonstration.
2. Make a list of the important steps and processes the demonstration will include. Have these as complete as possible.
3. Arrange these steps and processes in logical order. This has much to do with the clearness of the demonstration.
4. Divide these steps equally between the two demonstrators.
5. Decide which demonstrator will give the introduction and which the summary.

Presenting a Demonstration Effectively

A demonstration should be presented in a pleasant, courteous, and natural manner.

Smile, be natural. Call your teammate by name.

Speak distinctly and at a moderate speed.

Use good English. Avoid use of words *you* and *I*.

Emphasize the verb by placing it at the beginning of the sentence. Example: *Measure* the grain in this manner.

Do not mention commercial names.

Ask for questions at the close of the demonstration.

Answer them clearly. Repeat them for the benefit of the whole audience. Vary words in so doing. Example: In answering the question; in replying to the question.

Have good posture. Do not lean on the table.

Score Card for 4–H Club Team Demonstrations

The following score card for 4–H Club team demonstrations has been approved by the U. S. Department of Agriculture and the State club leaders:

Subject Matter (30):	
1. Importance of subject matter presented as related to fundamental problems of home or farm	12
2. Accuracy and clearness of statements made	8
3. Completeness of information given	5
4. Replies to practical questions asked by judges	5
	30
Presentation (40):	
1. Preparation, arrangement, and use of materials in demonstration	10
2. Teamwork, ease, skill, and smoothness of procedure	10
3. All steps and processes made clear	5
4. Personality and manner pleasant and businesslike	7
5. Appearance—suitably dressed. Demonstrators should wear nothing that detracts from demonstration	3
6. Voices clear, distinct, and reasonably strong. Facility of expression	5
	40
Results (30):	
1. Effect on the audience—did the demonstration sell the point?	10
2. Finished product or principles well taught?	10
3. Practicability. Actual club practices demonstrated and enforced	10
	30
Total	100

Explanation:

1. A methods demonstration involves—
   a. Working with materials.
   b. Actually demonstrating a process.
   c. Showing a result.
2. A lecture demonstration does not demonstrate a process. Materials may be handled; processes may be explained by talking, pictures, or charts; and a definite completed result may or may not be shown, excepting pictures or charts. If there is a finished product, it should be considered; but the demonstration may not require one and should have no penalty.

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